

## TWO NEW SPECIES OF THE ALCYONACEAN GENUS *PROTODENDRON* (OCTOCORALLIA: ALCYONIIDAE) FROM THE INDIAN OCEAN OFF NATAL

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### ABSTRACT

Two new species of the alcyoniid genus *Protodendron* obtained off the southeastern coast of Africa by the IIOE vessel ANTON BRUNN is described and compared with the type species, *Protodendron repens* (Thomson and Henderson, 1906). Taxonomic characters of all three species are illustrated by scanning electron micrographs.

*Protodendron repens* was first described by Thomson and Henderson (1906: 436, pl. 31, fig. 1) under the name *Coelogorgia repens* from specimens collected by Cyril Crossland at Wasin, Zanzibar. Specimens collected by the SIBOGA Expedition at station 123 in North Bay, Biaru Island (36-27 m) off the northeastern peninsula of Celebes, and station 250 in 27 m off Kur Island in the Kei Islands were described in detail by Thomson and Dean (1931: 22, pl. 9, fig. 3), who correctly removed the species from *Coelogorgia* and established for it the new genus *Protodendron*. Specimens collected during the International Indian Ocean Expedition by Dr. A. G. Humes at two localities in Madagascar were studied by Dr. J. Verseveldt (1973: 70, fig. 1) and compared with both original type material from Zanzibar and the specimens from the SIBOGA Expedition, reaching the conclusion that all specimens were conspecific, that the genus *Protodendron* established by Thomson and Dean was justified, but that the new family Archicaulidae proposed by them was unnecessary. The clusters of polyps bear a striking resemblance to the terminal branchlets of *Lemnalia* (Bourne, 1990: pl. 40), and the bent or arched spindles of *P. repens* are not unlike some of the smaller forms present in that genus. Verseveldt's assignment of *Protodendron* to the family Alcyoniidae appears to be fully justified.

Specimens referable to the genus *Protodendron* were obtained during the International Indian Ocean Expedition by R/V ANTON BRUNN off Inhambane District, Mozambique, and off Durban, Natal. These differ sufficiently among themselves and from *P. repens* to be regarded as two distinct new species. Stations 391F, 391J and 392K off Durban yielded numerous colonies with morphology generally similar to *Protodendron repens* but with conspicuously different sclerites. These comprise two distinct species which are described below.

### Family Alcyoniidae

#### Genus *Protodendron* Thomson and Dean, 1931

*Coelogorgia* (part).—Thomson and Henderson, 1906: 435.

*Protodendron* Thomson and Dean, 1931: 22 (type species, *Coelogorgia repens* Thomson and Henderson, 1906, by monotypy).—Verseveldt, 1973: 70.—Bayer, 1981: 909 (in key only).

The sclerites of some specimens taken during the International Indian Ocean Expedition agree in size almost exactly with the measurements given by Thomson and Henderson (1906) for *Protodendron repens*, but are conspicuously developed as elongate clubs, with their distal ends enlarged, spinose, and directed outward from the surface of the anthostoles. These sclerites predominate in the outermost layer and are clearly visible even under low magnification. Other specimens from

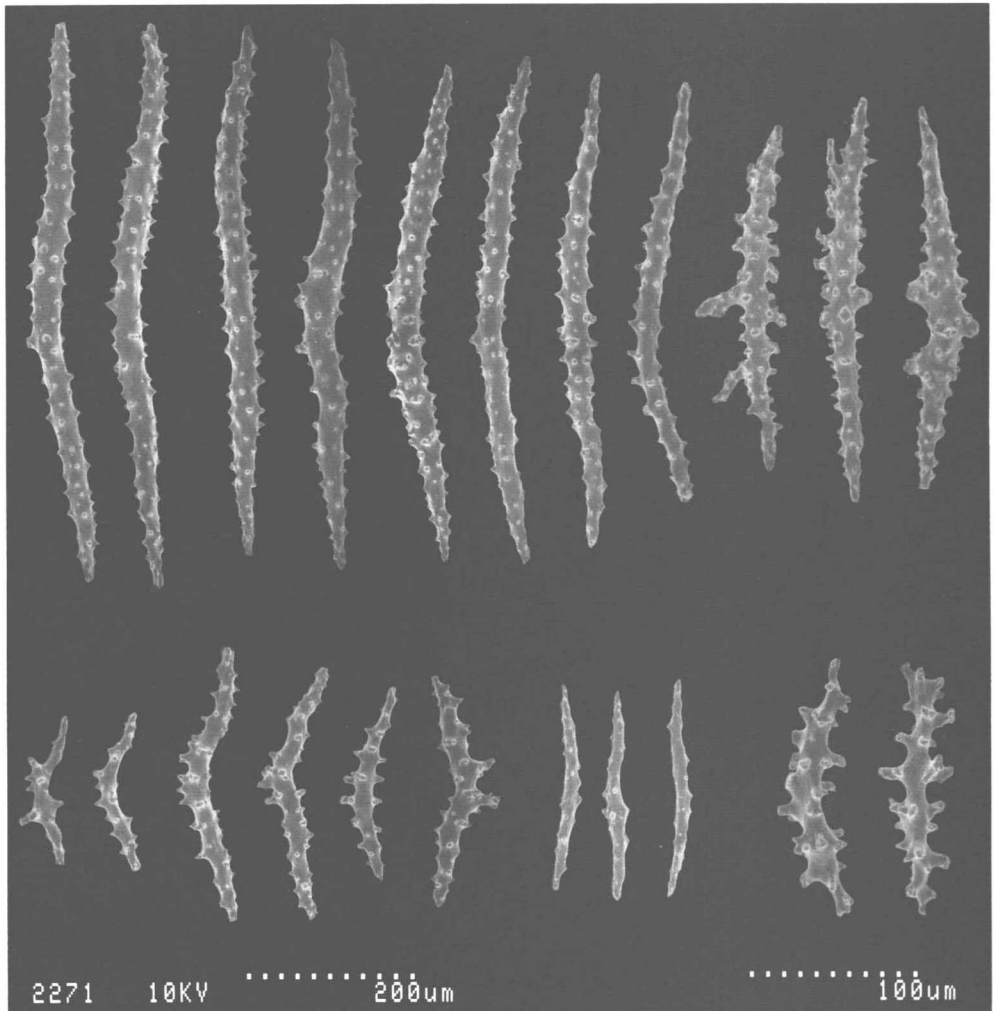


Figure 1. *Protodendron repens* (Thomson and Henderson). Sclerites.

the same stations have similarly developed but much smaller clubs, as well as tuberculate capstans rather than long spindles predominating in the stolon-like, membranous extensions of the coenenchyme. As neither of these forms can be accommodated in *Protodendron repens* as originally defined and subsequently confirmed by Thomson and Dean (1931) and Verseveldt (1973), they are here established as two new species of the distinctive genus *Protodendron*.

*Protodendron repens* (Thomson and Henderson)

Figure 1

*Protodendron repens* Thomson and Henderson, 1906: 435, pl. 31, fig. 1.—Verseveldt, 1973: 70, figs. 1, 2.

**Material Examined.**—Mozambique, off Inhambane District: 24°46'S, 35°20'E, 32 m HIOE, R/V ANTON BRUUN sta. 371E, 18 July 1964. One colony, USNM 59273.

**Diagnosis.**—*Protodendron* with acute spiny spindles about 1 mm in length, and small curved rods in the tentacles.

**Description.**—This species has been thoroughly described by Thomson and Henderson, 1906: 436; Thomson and Dean, 1931: 22; and Verseveldt, 1973: 70.

**Remarks.**—In their description of the sclerites of *P. repens* Thomson and Henderson (1906) reported only spindles up to 0.75 mm in length. Thomson and Dean (1931) reported straight and curved spindles up to 0.95 mm long but found no “pseudo-clubs” in the SIBOGA material. Verseveldt (1973) compared his specimens from Madagascar with both original syntypic material from Zanzibar and the SIBOGA specimens, concluding that all three are conspecific. He does not mention or illustrate club-shaped sclerites (1973: 72, fig. 2), and they are not present in a preparation made from one of his specimens from Madagascar. Examples from this preparation have been examined by SEM (Fig. 1), completely confirming the observations of Verseveldt.

### *Protodendron bruuni* new species

Figures 2–5

**Material Examined.**—Natal, off Durban: 29°26'S, 31°46'E, 77 m, IIOE, R/V ANTON BRUUN sta. 391F, 9 September 1964. 20+ colonies, syntypes, USNM 93241 (SEM 2078, 2079, 2268–2270).

Natal, off Durban: 29°21'S, 31°35'E, 57 m, IIOE, R/V ANTON BRUUN sta. 391J, 9 September 1964. 20+ colonies, USNM 93239.

Natal, off Durban: 29°19'S, 31°26'E, 38 m, IIOE, R/V ANTON BRUUN sta. 391K, 10 September 1964. 20+ colonies, USNM 93240.

**Diagnosis.**—*Protodendron* with monaxial sclerites strongly developed as clubs in addition to spindles; tentacles with transversely placed small, curved rods.

**Description.**—The colonies consist of clusters of as many as 10 or more partially united polyps (Bourne's term “syndeté” (1900) as used by Verseveldt) arising at irregular intervals from a narrow, stolon-like coenenchymal membrane encrusting the tubes of polychaete annelids. Isolated single polyps sometimes occur along the coenenchymal ribbons, and groups of two to four or five (Figs. 2, 3) are common. The polyps are united along the proximal half of their length, the projecting free “calicular” part in most cases being only about 1.5–1.75 mm tall, unlike *P. repens*, in which they reach 6 mm (Thomson and Dean) or even 8 mm (Thomson and Henderson); in a few instances, projecting “calices” can be as much as 3 mm tall and about 0.5 mm wide (Fig. 2). Anthocodiae with tentacles folded over the oral region are 1.5–2.0 mm tall (Figs. 2–4).

The wall of the projecting calicular part, here called the anthostele in conformity with the definition in Bayer et al. (1983), is marked by 8 narrow longitudinal grooves separating wide, rounded ridges which terminate distally in 8 marginal teeth. A distinct neck-zone intervenes between the calicular margin and the contracted anthostele, which is stiffened by 8 intermesenterial tracts of longitudinally disposed spindles that reach the base of the tentacles; proximally the spindles diverge but do not become transversely aligned as a collaret or crown (Fig. 3, bottom). Smaller spindles extend longitudinally upward along the base of the tentacles, becoming smaller and transversely placed distad (Figs. 2, 3, bottom).

The surface of the colonies has a glistening, frosted appearance owing to the colorless, translucent sclerites. The “syndeté” and especially the calices are prickly with the projecting, outwardly slanted distal ends of the predominant club-shaped superficial sclerites. Those lying in the eight longitudinal tracts beneath the tentacles have one end obliquely bent and serrated (Fig. 5d), the largest in



Figure 2. *Protodendron bruuni* n. sp. Top, Cluster of partly fused polyps. Bottom, Contracted anthocodia of same. Stereoscopic pairs, SEM, magnification as indicated by scale bars. Syntypes, USNM 93241.

the calicular walls with one end strongly enlarged and thorny (Fig. 5e) reaching about 0.54 mm in length. Their orientation in situ is clearly shown in the stereoscopic views reproduced in Figures 2–4. As in *P. repens* the tentacles have small, curved, transversely placed rods (Fig. 5a) (Verseveldt, 1973: 72) clearly visible in Figures 2–4, reaching about 0.25 mm in length (Fig. 5b), which merge proximad with the larger, converging spindles of the tentacle bases (Fig. 5c) and

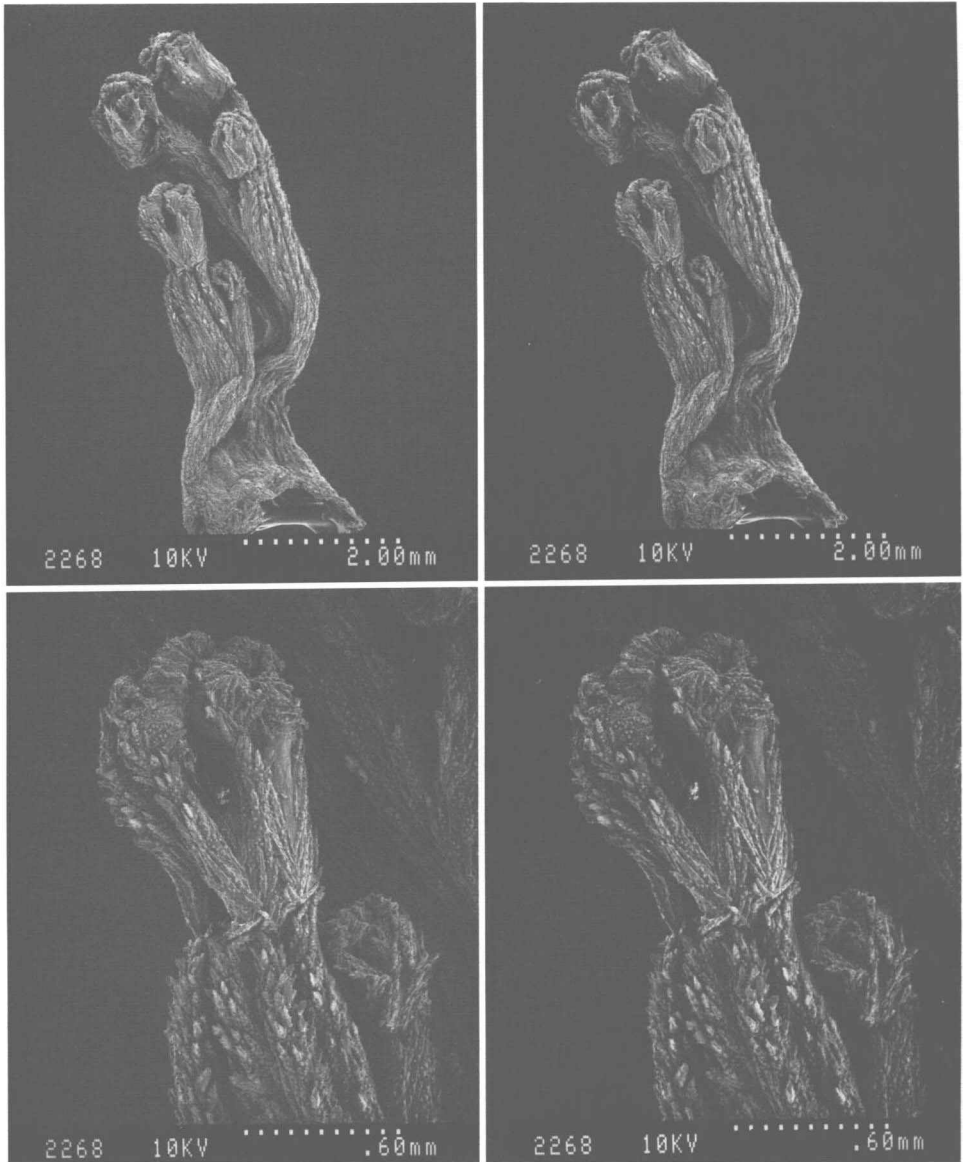


Figure 3. *Protodendron brunni* n. sp. Top, Cluster of partly fused polyps. Bottom, Contracted anthocodia of same. Stereoscopic pairs, SEM, magnification as indicated by scale bars. Syntypes, USNM 93241.

intergrade with the larger spindles longitudinally placed in the anthocodial wall below each tentacle (Fig. 5d). The sclerites of the coenenchymal membrane are acute spindles (Fig. 5f), reaching a little more than 0.7 mm in length; forms with one end weakly enlarged intergrade with the distinctly club-shaped sclerites of the calicular walls (Fig. 5e). The ornamentation of the larger sclerites is sharply spinose and the spines tend to become complex (Fig. 5f). As mentioned by Thom-

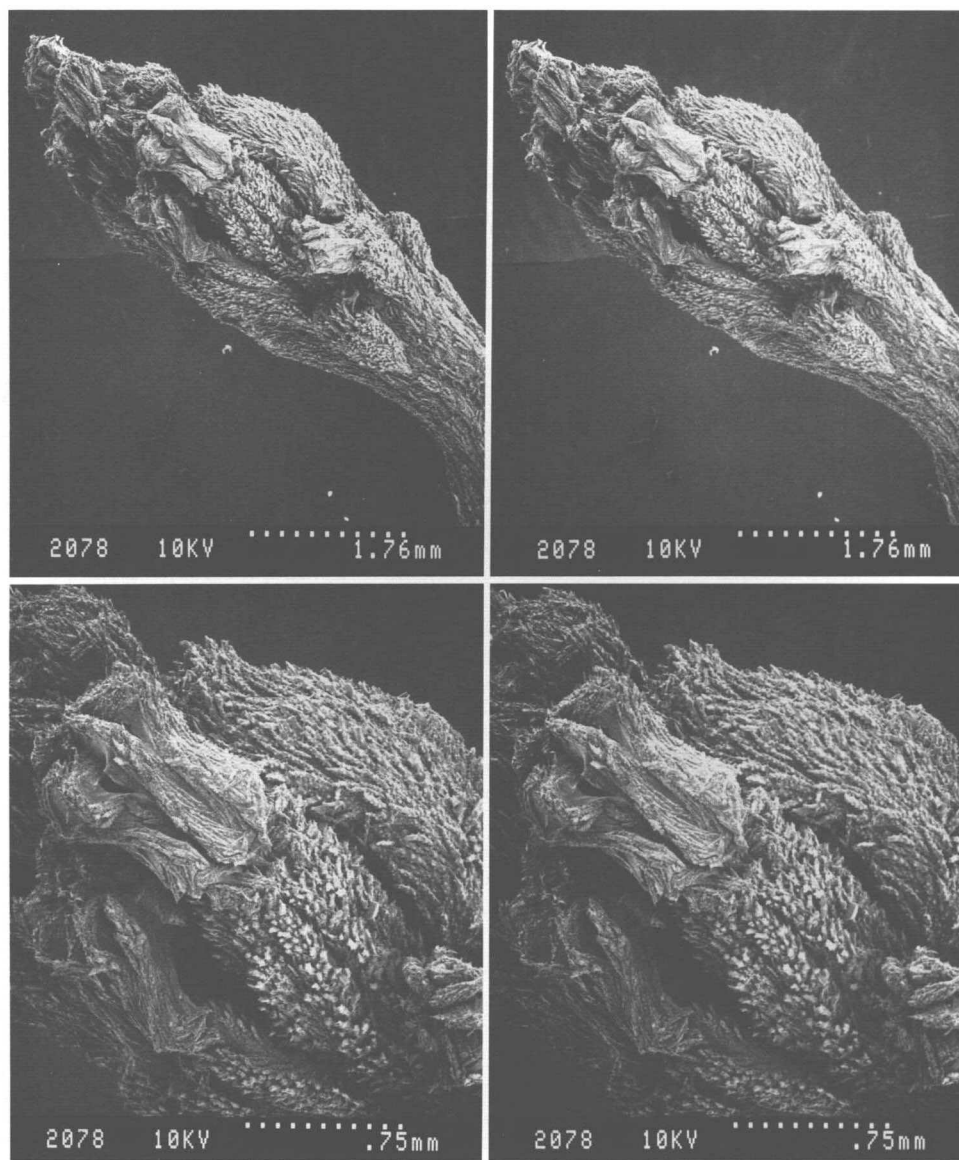


Figure 4. *Protodendron bruuni* n. sp. Top, Cluster of partly fused polyps. Bottom, Contracted anthocodia of same. Stereoscopic pairs, SEM, magnification as indicated by scale bars. Syntypes, USNM 93241.

son and Dean for *P. repens*, there is a tendency toward coalescence of the larger sclerites (Fig. 5g).

**Etymology.**—Named in honor of Anton F. Bruun and his namesake the R/V ANTON BRUUN, which participated in the International Indian Ocean Expedition.

**Remarks.**—The club-shaped sclerites of the calices and anthocodiae impart to the colonies a distinctly prickly aspect that is readily visible even under moderate magnification. They are such a conspicuous feature that they could not have been

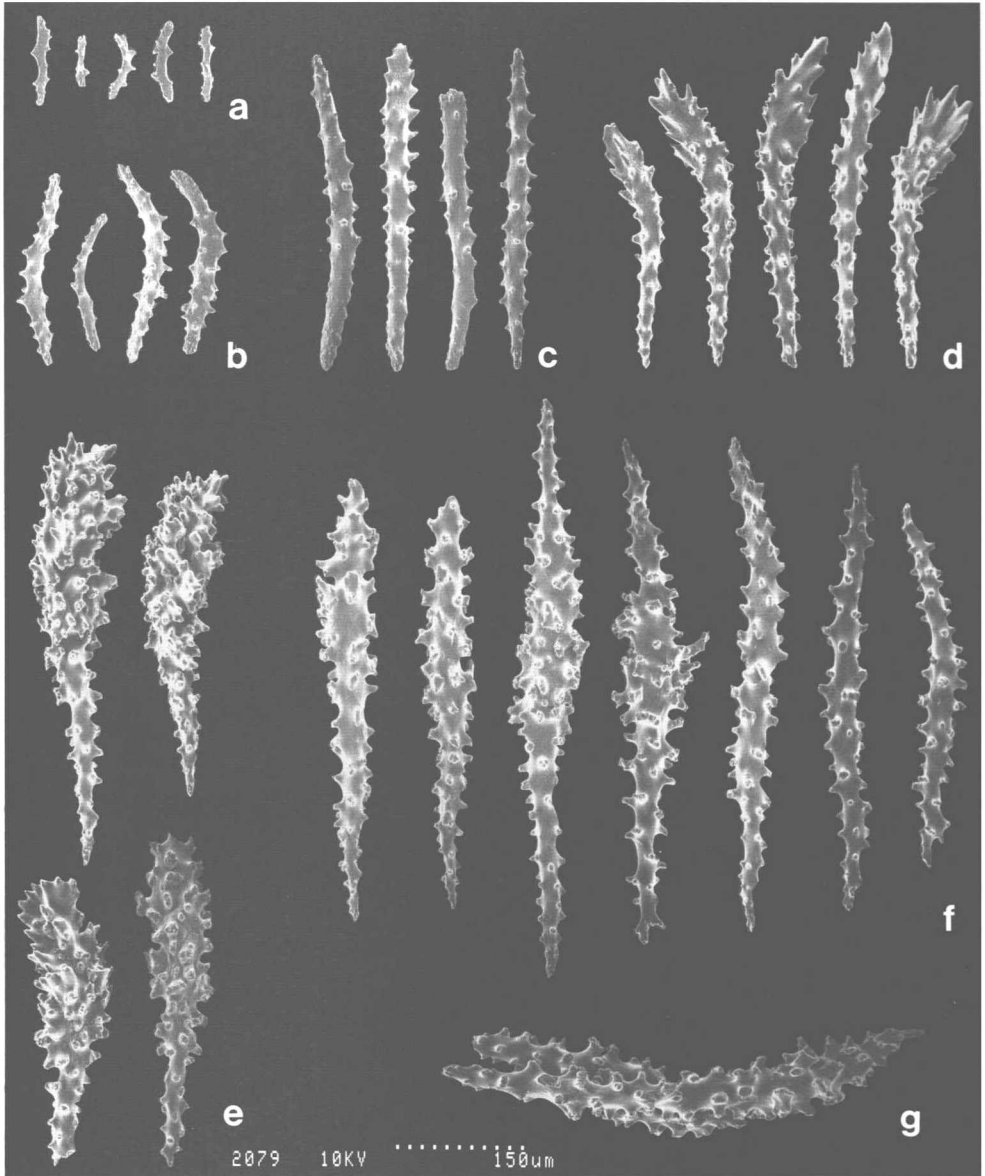


Figure 5. *Protodendron bruuni* n. sp. Sclerites. a, Small curved rods from backs of tentacles; b, Larger curved rods from tentacle bases; c, Thorny spindles from anthocodial wall below tentacles; d, Bent clubs from anthocodial wall below tentacles; e, Clubs from calicular walls; f, Spindles from fused part of polyps and coenenchymal membrane; g, partially fused sclerites. SEM, magnification as shown by scale bar. Syntype, USNM 93241.

overlooked by Thomson and Henderson and Thomson and Dean had they been present in *Protodendron repens*, and they are not present in Verseveldt's material (Fig. 1). These bent, club-like spindles are modified in the same way that the calicular sclerites of *Muriceides* (Grasshoff, 1977: 50, fig. 44; 55, fig. 50) and

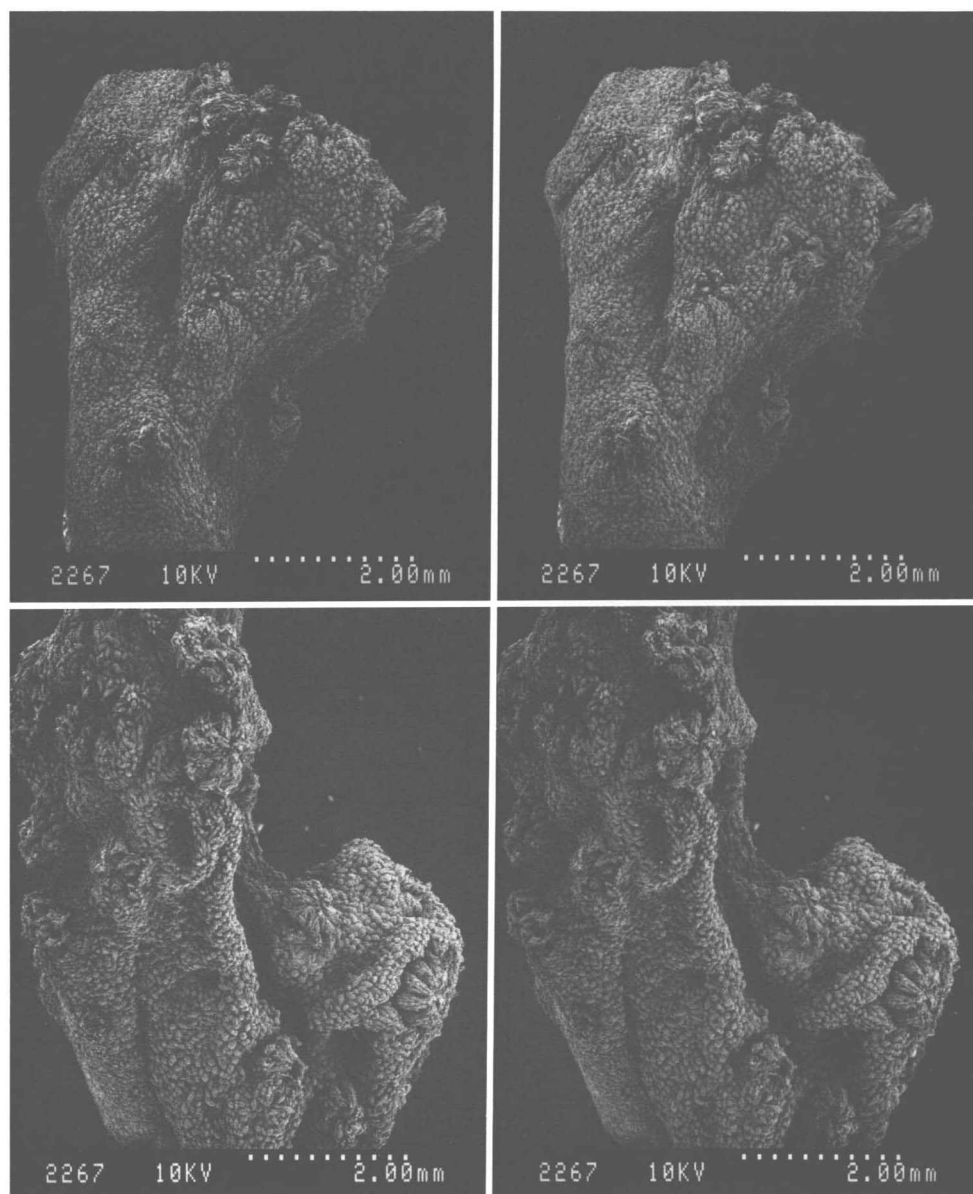


Figure 6. *Protodendron verseveldti* n. sp. Clusters of partly fused polyps. Stereoscopic pairs, SEM, magnification as indicated by scale bars. Syntypes, USNM 93230.

*Anthothela* (Bayer, 1961: 69, fig. 13) are modified, possibly to provide a thorny defensive surface in the vicinity of the anthocodiae.

***Protodendron verseveldti* new species**  
Figures 6–8

*Material Examined.*—Natal, off Durban: 29°26'S, 31°46'E, 77 m, IIOE, R/V ANTON BRUUN sta. 391F, 9 September 1964. 5+ colonies and fragments, syntypes, USNM 93230 (SEM 2080, 2267).



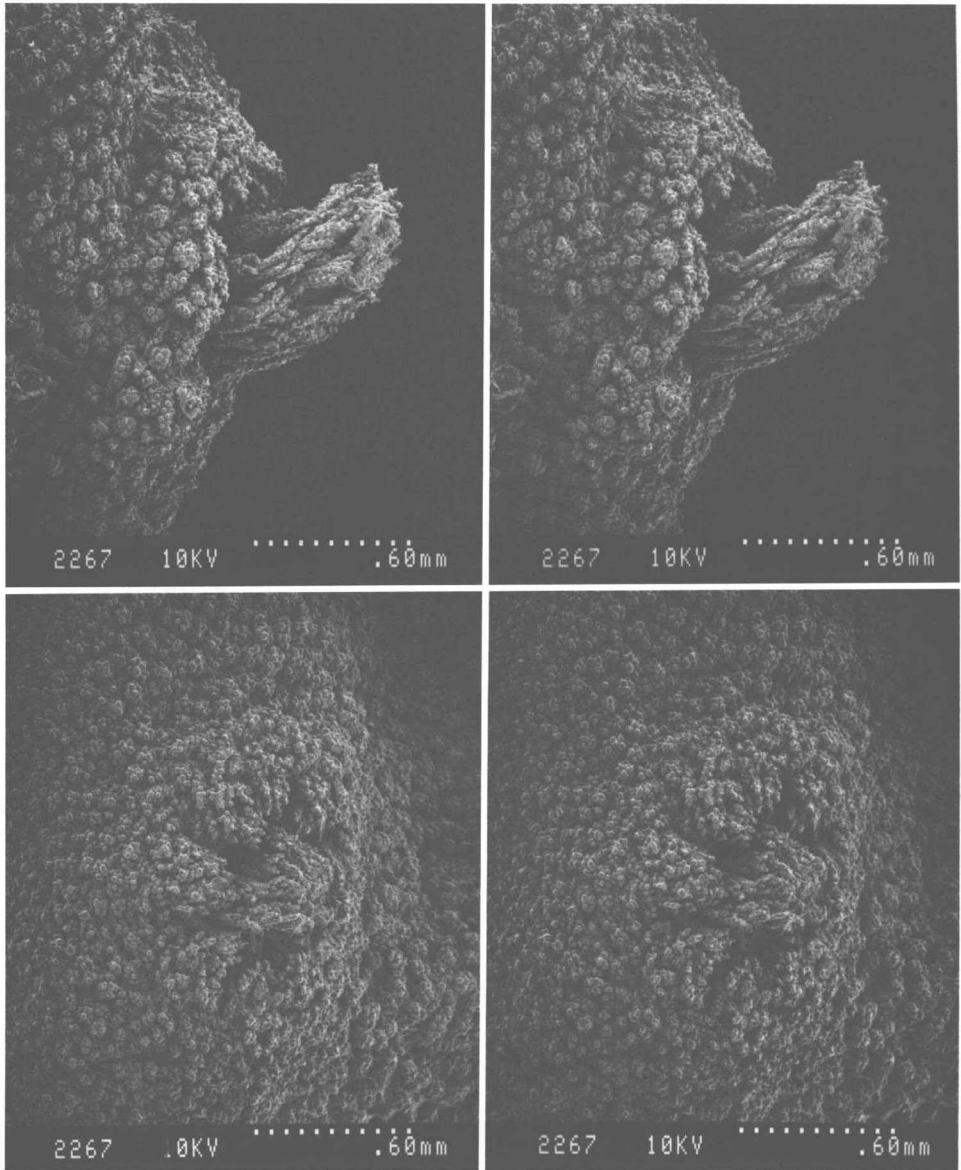


Figure 7. *Protodendron verseveldti* n. sp. Top, Low calyx with anthocodia partly extended; Bottom, Slightly elevated calyx with only tip of retracted anthocodia exposed. Stereoscopic pairs, SEM, magnification as indicated by scale bars. Syntypes, USNM 93230.

Natal, off Durban: 29°21'S, 31°35'E, 57 m, IIOE, R/V ANTON BRUUN sta. 391J, 9 September 1964. 2 colonies, USNM 93229.

Natal, off Durban: 29°19'S, 31°26'E, 38 m, IIOE, R/V ANTON BRUUN sta. 391K, 10 September 1964. 1 colony and fragments, USNM 93231.

**Diagnosis.**—*Protodendron* with blunt warty spindles about 0.22 mm long and capstans up to 0.12 mm long; tentacles without sclerites.

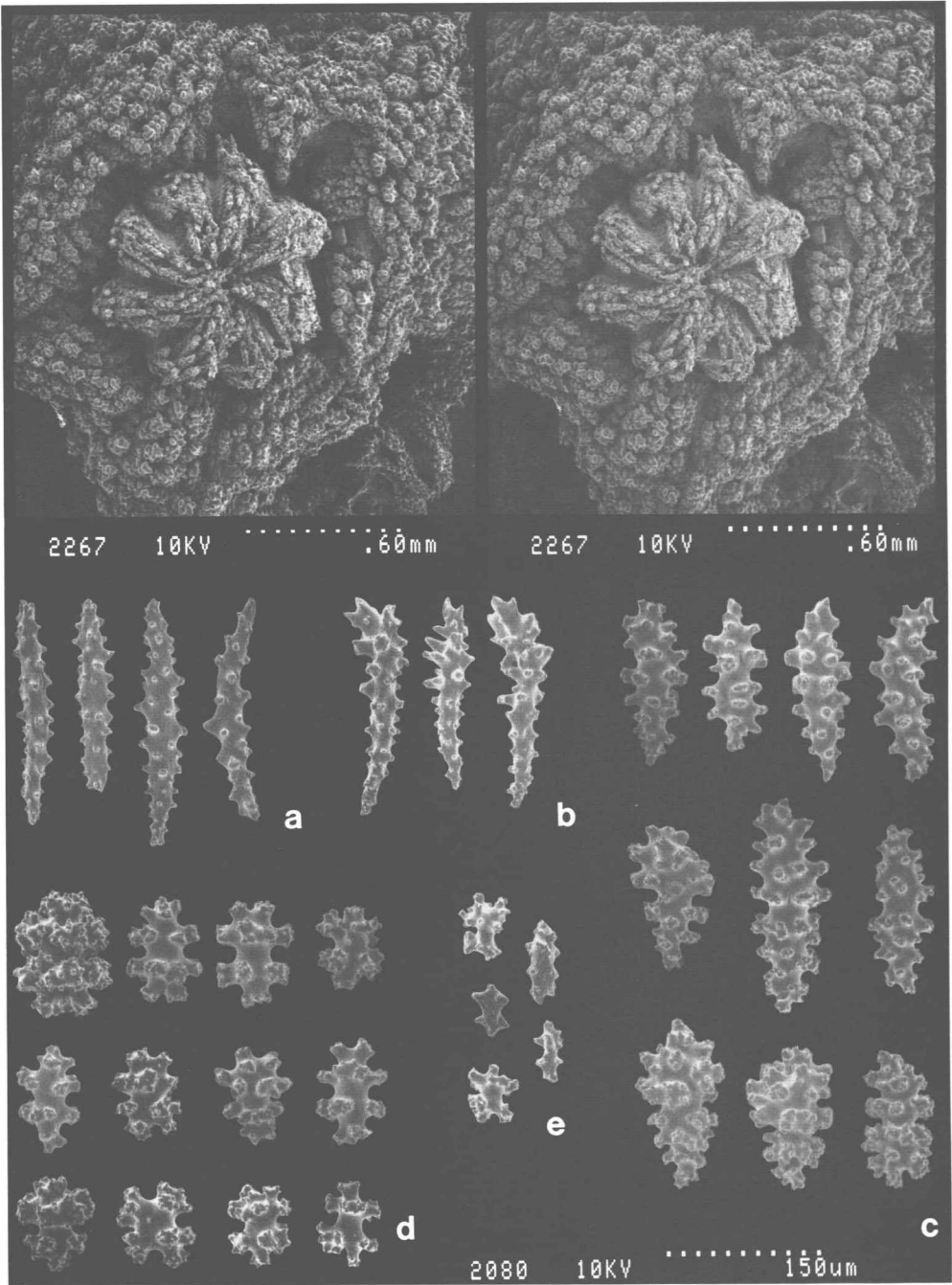


Figure 8. *Protodendron verseveldtii* n. sp. Top, Low calyx with contracted anthocodia partly extended; SEM, stereoscopic pair; Bottom, Sclerites: a, Spiny spindles from anthocodia; b, Clubs from anthocodia; c, Warty spindles from calices and coenenchyme; d, Capstans from calices and coenenchyme; e, Small forms from calices and coenenchyme. SEM, magnifications as indicated by scale bars. Syn-types, USNM 92320.

*Description.*—The colonies consist of clusters of polyps arising at irregular intervals from a stolon-like coenenchymal membrane encrusting the chitinous tubes of polychaete annelids. The polyps comprising the node-like clusters (Fig. 6) may form low, wart-like calices up to about 1 mm tall and the same width, with distinctly 8-lobed margins and distinct longitudinal grooves corresponding with the location of the mesenteries; those situated nearest the stolon may be raised little if at all above the general surface (Fig. 7, bottom), leaving only 8-lobed orifices within which the anthocodiae are more or less completely withdrawn. Several polyps preserved with tentacles extended reveal that the tentacles and pinnules are devoid of sclerites.

The polyps can be fully retracted within the 8-lobed calicular orifices, but in some cases leaving the anthocodia more or less exposed (Fig. 8) or with only the distal part of the tentacles extended (Fig. 7). The anthocodial wall above the neck-zone is provided with 8 intermesenterial tracts of spindles (Fig. 8a) and small, thorny clubs (Fig. 8b) weakly converging toward the bases of the tentacles. The calices are filled with small, warty spindles about 0.22 mm long, intergrading with ornate tuberculate capstans and simpler capstans with two whorls of tubercles and terminal clusters (Fig. 8d). The largest and most ornate capstans are about 0.125 mm long, but the smaller, less complex forms about 0.1 mm long are abundant. Numerous more or less irregular forms are also present, some distinctly showing derivation from the simple, 6-rayed form that is widespread in *Octocorallia* (Fig. 8e).

*Etymology.*—Named in memory of the late Dr. J. Verseveldt, long-time friend and colleague, dedicated student of *Octocorallia*.

*Remarks.*—In spite of their general similarity to *Protodendron bruuni*, colonies of *P. verseveldti* are readily distinguished from that species by the finely granular appearance of the colonial surface, as well as the shorter, less prominent clusters of polyps, the completely retractile anthocodiae, and absence of sclerites in the tentacles.

#### ACKNOWLEDGMENTS

The new material described here was obtained during operations of R/V ANTON BRUUN while participating in the International Indian Ocean Expedition. I am grateful to the late Dr. J. Verseveldt for permitting me to examine his specimens of *Protodendron*, now in the Nationaal Natuurhistorisch Museum, Leiden, and providing me with a sample of sclerites for study by SEM. Ms. S. Braden, W. R. Brown and P. Viola of the SEM Laboratory, U.S. National Museum of Natural History, provided the micrographs that illustrate this paper. Ms. M. Kelly Ryan, staff illustrator, Department of Invertebrate Zoology, assembled and mounted the plates. I extend my thanks to all.

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